THE FISHES OF THE NILE.[1]

THESE two handsome volumes are a tribute to the late Dr. John Anderson's zeal in the cause of Egyptian zoology, and a justification of the cordial support which he had from Lord Lister, Dr. Günther, Sir E. Ray Lankester, and Dr. Sclater in prevailing on the Egyptian Government to undertake the inquiry. The author, the collector and the artist are to be congratulated on this important contribution to African ichthyology. Moreover, the region embraced in the description, as shown in the two excellent maps of the Nile system—Upper and Lower—is one of great interest to the general zoologist, for it contains the sole survivors of an order (Polypteridæ) abundantly represented from the Devonian to the Cretaceous, and includes one of the remarkable Dipnoans. It is an area in which the rare electrical fishes Mormyrus and Malapterurus (or, as the author has it, Malopterurus) are mingled with the subtropical and tropical Gymnarchus, the curious Heterotis, the Characinidæ, the Siluridæ, Ophiocephalus, the Anabantidæ, and the Cichlidæ; whilst by way of contrast these are associated with the cosmopolitan *Clupea finta* and *Mugil capito*, with the common *Anguilla vulgaris* and the ubiquitous *Morone labrax*. Yet these do not exhaust the sources of special interest, for not only were fishes, such as the Nile perch, preserved as mummies, their forms inscribed on ancient monuments or perpetuated in bronze models, but in this old-world country the number of fishes which carry and hatch their comparatively large ova and protect their young in the bucco-pharyngeal cavity is remarkable.

The problems connected with the origin and distribution of the fish-fauna are also replete with interest, and though many of these were dealt with by Mr. Boulenger in his valuable address to the zoological section of the British Association in South Africa, much yet remains for future workers both in substantiation and extension.

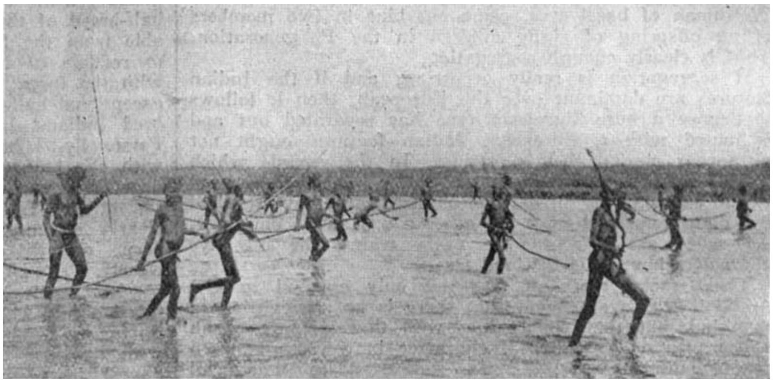

FIG. 1.—Fishing at the mouth of the Sobat. From "The Fishes of the Nile."

In the brief introduction the progress of the ichthyology of the Nile is described from 1757, the date of Hasselquist's "Iter Palæstinum," when only thirteen species from the Delta were known. Without going into detail, they had mounted up to eighty-nine in Dr. Günther's account of the fishes of Petherick's expedition, but did not exceed a hundred when the Egyptian Government undertook the present survey. Now the total is 192, and no one has had a greater share in this increase than the author.

An important part of the introduction is the illustrated account given by Mr. Loat, the collector, of the methods of fishing in the Nile, the accumulated skill of many ages having given the native all the practical advantages of his art, so that in this respect he is not inferior to the English, American and Japanese. The throwing- or casting-nets, circle-nets, sweep-nets, modified trammel-nets, long nets like those for sand-eels with a median pocket, push-nets, conical wicker traps, elaborate weirs of stones which closely resemble those at present in use in Japan, besides baited and unbaited hooks, show how varied these methods are. It is not to be supposed, however, that the casting-net is a novelty, for on the coast of Suffolk, for instance, an adept will throw it in a perfect circle. Mr. Loat collected no less than 11,000 specimens, and amongst these were thirty new species. Moreover, just as the Irish use the fatal spurge-root in their rivers, so the Egyptian pulverises the seeds of *Berbera* (or *Mellettia*) *ferruginea*, or "Burberra," for poisoning fishes. In two or three hours thousands, it may be, rise to the surface.

The thorough method in which Mr. Boulenger treats his subject is apparent throughout; elaborate tables of twelve measurements, in addition to nine notes of the number of spines, rays and scales in different parts, accompany each species. He, however, evidently makes too much, at the expense of Rüppell and others, of De Johannis as a pioneer in Egyptian ichthyology, for this author's descriptions and figures have much that is incorrect in them. Moreover, there is a tendency to split species where others group them, and to group them where others split them, the latter being just the fault he himself lately criticised, and with justice, in Smitt. Further, insignificant specific variations between the Nilotic fish-fauna and that of West Africa need not be insisted on too strongly where, as pointed out long ago, the similarity is so great. In looking at the slight diversities between such species as *Marcusenius discorhynchus*, *M. petherici*, *M. budgetti*, and *M. tanganicanus*, the thought involuntarily asserts itself that in the future a different view may be taken of their relationships. Again, there are cases in which the indefatigable author has examined 100 to 200 examples of a fish normally possessing ten to eleven dorsal rays, but he finds that three or four per cent. have seven or eight rays only. It is surely unsatisfactory to describe such a fish as possessing D. 7–10. A more correct method would have been to record it as Dr. Günther has done, viz. D. (7–8) 9–10.

One of the most interesting features in the Crossopterygians is the frequent allusion to the labours of the lamented Mr. J. S. Budgett, who contracted a fatal illness whilst pursuing his valuable work on the development of the group in the Niger Delta. Considerable advances have been made in the Dipnoans, that of the Nile (*Protopterus aethiopicus*) differing in habit from *P. annectens* of the West Coast. Of Teleosteans there are nineteen families, and the author gives two classifications, (1) an anatomical, and (2) one based on external characters. Both are valuable. The first family of the Malacopterygians is the generalised Mormyridæ, remarkable for the large size of the brain and the "problematic organ" above it, as well as for their electric organ. Four families, each represented only by a single species, follow, the last being Cromeria, distinguished from the Galaxiidæ of the Haplomi by the presence of a mesocoracoid (Swinnerton). The family of the Characinidæ (under the Ostariophysi) form a very generalised group confined to the fresh waters of Africa and Central and South America, from which the author thinks they may have migrated by a land connection in Upper Cretaceous times. These supposed precursors of the Cyprinoids number eighteen species in the Nile.

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[1] "Zoology of Egypt. The Fishes of the Nile." By G. A. Boulenger, F.R.S. Vol. i., text, pp. li+578; vol. ii., plates, pp. xviii+97 plates. (London: Published for the Egyptian Government by Hugh Rees, Ltd., 1907.) Two vols., price 8*l*. 8*s*. net.

The widely distributed family of the Cyprinidæ comprises the largest number of species within its limts, viz. fifty, and thirty-five of these belong to the genus Barbus, a large proportion, seeing that in Day's "Fishes of India and Neighbouring Regions" there are but seventy. Yet the genus is conspicuous by its absence from the Senegal, the Gambia, and Lake Chad. The author's wealth of material has enabled him to clear up the synonymy of certain species, such as *Lates coubie,* yet it is doubtful if, as in Europe, hybridism may not occur to a greater extent than is at present imagined. The representatives of the genus Barbus, of which there are no fewer than twenty-seven new species in the work, offer a wide field for the features just mentioned, since many are very closely allied, though separable, perhaps, by such points as the proportions of the snout. The tropical or subtropical Silurids are largely represented by fifteen genera and forty-one species, and the habits of some, such as Clarias, are full of interest, for they spend the dry season in burrows in dried-up marshes, which they leave at night in quest of food—both animal and vegetable—using the spines of the pectorals in progression. The name Malapterurus has so long been used that the author's change to Malopterurus jars, and for similar reasons he himself does not follow Starr Jordan in calling the species "*Torpedo*" *electricus.* It is noteworthy that whilst the fresh-water species are all generically distinct from the American, those species which enter the sea on both shores of the Atlantic agree (*e.g.* Arius). The Cichlidæ, a family which presents great difficulties from the close resemblances of many—*e.g.* those of Lake Victoria—have increased, largely by the labours of Mr. Boulenger, during the last few years from twenty species to 210 in Africa, and of these eighteen belong to the Nile. The author considers that the forms inhabiting that great lake (Victoria) sprang from a small number of original (isolated) types, and were modified into a multitude of species according to lines different from those followed by other colonies. Only two or three of these are identical with or very closely related to forms in neighbouring rivers.

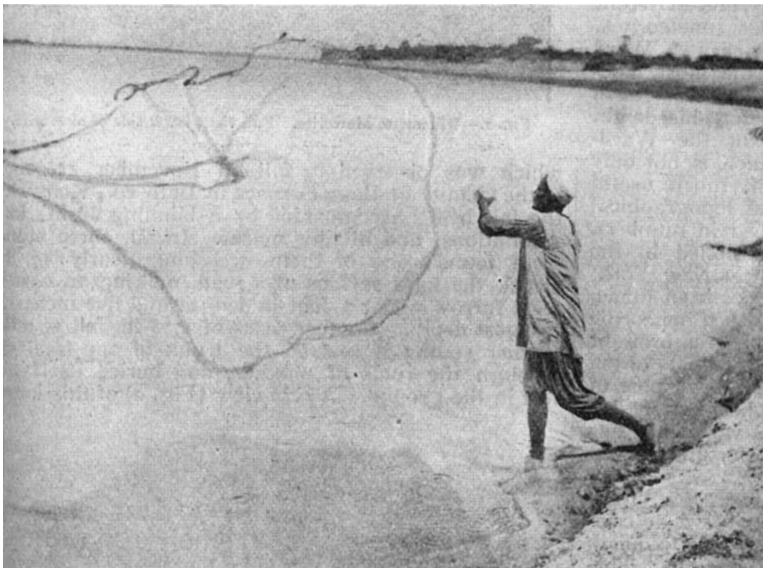

FIG. 2.—Throwing-net as used on the Lower Nile. From "The Fishes of the Nile."

Though many interesting facts in regard to reproduction and development are incidentally noted in this fine work on Nile fishes, especially in connection with Mr. Budgett's investigations on Polypterus, Protopterus, and on the breeding of the Mormyridæ, very much yet awaits the observer in this department, and no more fascinating field exists, to judge from the fragmentary knowledge available. Some, like *Hyperopisus bebe,* attach their oval eggs to rootlets of grass, and the larvæ hang in thousands, like amphibians, to the rootlets until the yolk-sac is absorbed. Others have floating nests 2 feet long by 1 foot broad (*Gymnarchus niloticus*) for eggs 10 mm. in diameter, and for larvæ with long gill-filaments. A still larger nest (4 feet in diameter) characterises *Heterotis niloticus,* the larvæ of which also have gill-filaments. The eggs of *Cyprinodon fasciatus* have long filaments, like those of the garfish, which entangle them in masses or suspend them to various objects. The large number of fishes which carry their ova and larvæ in their bucco-pharyngeal cavity is a prominent feature, and Mr. Boulenger has found that it is almost invariably the female which does so, not the male, as in such forms as Arius. In some cases (*Haplochromis strigigena*) the male makes a small cavity in the sand where the eggs are fertilised, the female thereafter taking them into her mouth, and fasting for a fortnight. Yet animals much lower in the scale than fishes do almost the same thing, as in the case of *Asterias Mülleri,* the fertilised eggs and larvæ of which are borne in a mass by the parent over the mouth. The Egyptian fishermen, however, explain the presence of the ova in the mouth of the fishes very simply, viz. by a "reversed method of parturition." The whole subject, from the development of the nuptial tubercles in the males to the post-larval stages of these remarkable Nile fishes, bristles with features of interest. In addition, the field of fish-physiology is inviting. Why is it that *Polypterus bichir* (a fish which dies in tolerably fresh water if prevented from reaching the air) cannot live in brackish water, and that slight salinity kills it? whilst one species of fish in Lake Menzaleh thrives either in fresh or salt water, and another dwells equally in a hot spring at Makulla, in the Persian Gulf, and in salt water all round the Red Sea. The author takes in hand the explanation of the peculiar coloration of *Synodontis batensoda,* in which the ventral aspect of the body is darker than the upper, viz. as a provision in connection with the habit of swimming in a reversed position. Yet this explanation will not avail for the post-larval Callionymus. Again, are the habits of Anabas in Africa similar to those in India?

The able author has brought to the task not only his former experiences of African fishes—north and south, east and west—but the whole resources of the British Museum, and the vast storehouse of information amassed during the lifelong labours of Dr. Günther, and he has accomplished it in a manner creditable to the Egyptian Government, to science, and to himself. His work, indeed, will long form the basis of future labours in the ichthyology of the Nile. The whole of the families are as admirably illustrated as described in the beautiful volume of lifelike lithographs by Messrs. Smit and Green, their work rivalling the exquisite finish of the late G. H. Ford, long *facile princeps* in the department. Finally, if any suggestion may be made in a work so carefully performed, it is that in the index the synonyms might have been printed in italics, and that, in the text, plate xiv. should be substituted on p. 84 for plate xv. W. C. M.

SOME RECENT PAPERS ON METEORITES.

WE have before us a number of reprints of recent papers descriptive of various meteorites. Several of these are by the late Dr. Henry A. Ward and the late Prof. E. Cohen, two of the most indefatigable workers in this subject, whose loss is much to be deplored. In 1904, two years before his death, Dr. Ward published a "Catalogue of the Ward-Coonley Collection of Meteorites," which is not only a catalogue, but contains, in addition, much useful information, including alphabetical and topographical lists of all known meteorites (about 680 in number). The Ward-Coolney collection, now exhibited in the American Museum of Natural History at New York, is one of the most complete that has ever been made, containing as it does representatives of 603 meteoritic falls; it is further remarkable in that it was brought together in the comparatively short space of time of ten years. Prof. Cohen died in 1905, and a third part of his "Meteoreisenkunde" was published after his death; this, which is the only general work that has yet been attempted on meteorites, unfortunately remains incomplete.

Dr. H. A. Ward (Proc. Rochester Acad. Sci., 1904, vol. iv., pp. 137–148, with 6 plates) gives a description of the Willamette meteorite, which was found in 1902 near the town of Willamette, in Oregon. This mass of metallic nickel-iron measures $10 \times 6\frac{1}{2} \times 4\frac{1}{4}$ feet, and weighs 31,107 lb. (about 15½ tons); it is the third largest meteorite as yet known. Like the largest on record, the Anighito, of 36½ tons, brought by Commander R. E. Peary from Cape York, in Greenland, it is now exhibited in the American Museum of Natural History. The second largest known meteorite is that of Bacubirito, in Mexico, which has an estimated weight of 27½ tons; this mass, though unearthed and described by Dr. Ward in 1902, has not been removed from the place where it was found. The Willamette meteorite is roughly conical in form, and it was found embedded in the ground with the base of the cone uppermost, suggesting that the apex of the cone was to the front of the falling meteor. The mass is remarkable for the deep, rounded, and cylindrical pits, of which several types are distinguished, on the sides and the base of the cone. The deep cavities on the base (Fig. 1) are accounted for by the weathering and rusting action of water standing in pools on the exposed part of the mass as it lay for unknown ages in the soil of the primeval forest of a very moist region. The pittings and groovings on the sides are attributed by the author to the erosive action of the air during the flight of the meteorite; but it seems more likely that they have been produced by weathering in the ground, and that none of the original surface now remains. The nodules and rods of troilite (iron sulphide) enclosed in the metallic iron no doubt formed the centres around which the weathering has proceeded. The Widmanstätten figures on an etched section of the iron show the structure to be octahedral with broad lamellæ. The specific gravity of the iron is 7·7, and it contains 91½ per cent. of iron, 8 per cent. of nickel, and small amounts of cobalt and phosphorus.

Dr. H. A. Ward (*ibid.*, 1905, vol. iv., pp. 193–202) also gives an account of the Bath Furnace aërolite, which was observed to fall on November 15, 1902, in the vicinity of Bath Furnace in Bath co., Kentucky, the fall being accompanied by a blinding light, loud detonations, and hissing noises. In all, three stones were found; one of them, weighing nearly 13 lb., struck the hard surface of a road, making an east to west furrow about a foot in length and five inches in greatest depth. Another mass of 177¼ lb. fell 1¾ miles further south; it scarred the trunk of one tree, cut through the roots of another, and buried itself two feet in the ground. A side view (Fig. 2) of this larger stone shows very clearly a system of furrows radiating from the apex, which were produced by the intense erosive action of the air during the flight of the stone. The internal structure of the Bath Furnace meteorite is that of a spheroidal chondrodite like that of the three previously known meteorites (Werchne Tschirskaja, South Russia, 1843; Trenzano, Italy, 1856; and Saline Township, Kansas, 1898), which fell during the November Leonids. Both the Bath Furnace and the Willamette meteorites gave rise to suits at law between the finders and the land owners. In other papers, Dr. Ward describes some new Chilian

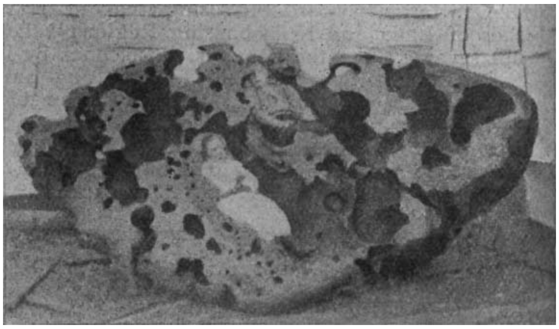

FIG. 1.—Willamette Meteorite. Full view, lower side of meteorite.

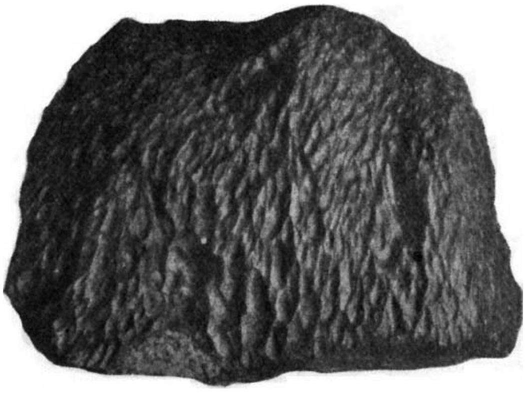

FIG. 2.—Bath Furnace Meteorite. Side view, showing furrows radiating from apex.